NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC79M00 Series

THREE TERMINAL NEGATIVE VOLTAGE REGULATOR

μPC79M00 series are monolithic three terminal negative regulators which employ internally current limiting, thermal shut down, output transistor safe operating area protection make them essentially indestructible.

They are intended as fixed voltage regulators in a wide range of application including local on card regulation for elimination of distribution problems associated wide single point regulation.

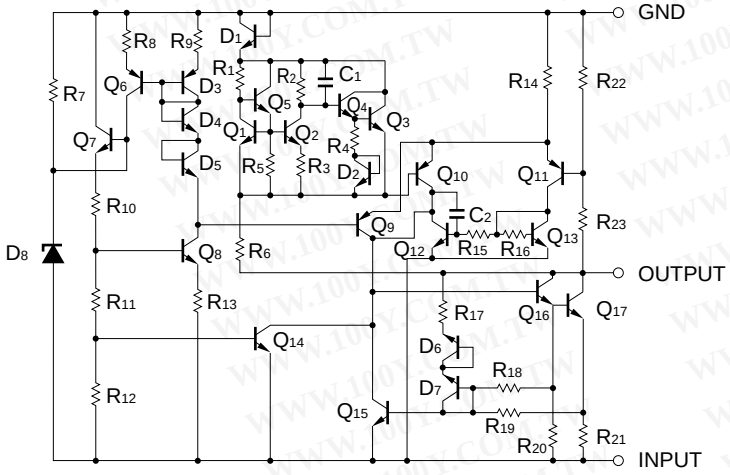
FEATURES

- Output current out of 500 mA.
- On-chip some protection circuit (over current protection, SOA protection and thermal shut down).
- Low noise.

★ ORDERING INFORMATION

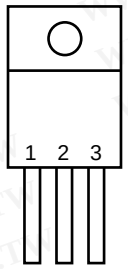
Part Number	Package	Output Voltage
μPC79M05HF	3-pin plastic SIP (MP-45G) (isolated TO-220)	–5 V
μPC79M08HF	3-pin plastic SIP (MP-45G) (isolated TO-220)	–8 V
μPC79M12HF	3-pin plastic SIP (MP-45G) (isolated TO-220)	–12 V
μPC79M15HF	3-pin plastic SIP (MP-45G) (isolated TO-220)	–15 V
μPC79M18HF	3-pin plastic SIP (MP-45G) (isolated TO-220)	–18 V
μPC79M24HF	3-pin plastic SIP (MP-45G) (isolated TO-220)	–24 V

EQUIVALENT CIRCUIT



PIN CONFIGURATION (Marking Side)

3-pin plastic SIP (MP-45G)



1: GND
2: INPUT
3: OUTPUT

The information in this document is subject to change without notice.

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The mark ★ shows major revised points.

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise specified)

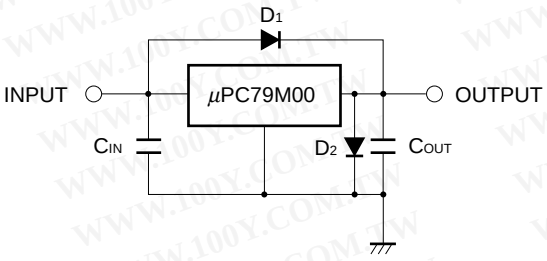
Parameter	Symbol	Rating	Unit
Input Voltage	V_{IN}	–35/–40 Note 1	V
Internal Power Dissipation	P_T	15 Note 2	V
Operating Ambient Temperature	T_A	–20 to +85	°C
Operating Junction Temperature	T_J	–20 to +150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Thermal Resistance (junction to case)	$R_{th(J-C)}$	7	°C/W
Thermal Resistance (junction to ambient)	$R_{th(J-A)}$	65	°C/W

Notes **1.** μPC79M05, 08, 12, 15, 18: –35 V, μPC79M24: –40 V

2. Internally limited. When operating junction temperature rise up to 150 °C, the internal circuit shutdown output voltage.

Caution Exposure to Absolute Maximum Ratings for extended periods may affect device reliability; exceeding the ratings could cause permanent damage. The parameters apply independently. The device should be operated within the limits specified under DC and AC Characteristics.

TYPICAL CONNECTION



C_{IN} : More than 2 μF.
C_{OUT} : More than 1 μF.
D_1 : Needed for $V_{IN} > V_O$.
D_2 : Needed for V_O > GND.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Part Number	MIN.	TYP.	MAX.	Unit
Input Voltage	V_{IN}	μPC79M05	–7	–10	–25	V
		μPC79M08	–10.5	–14	–25	
		μPC79M12	–14.5	–19	–30	
		μPC79M15	–17.5	–23	–30	
		μPC79M18	–21	–27	–33	
		μPC79M24	–27	–33	–38	
Output Current	I_O	All	5		350	mA
Operating Junction Temperature	T_J	All	–20		+125	°C

ELECTRICAL CHARACTERISTICS

μPC79M05

(V_{IN} = –10 V, I_O = 350 mA, 0 °C ≤ T_J ≤ +125 °C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25 °C	–4.8	–5.0	–5.2	V
		–7 V ≤ V_{IN} ≤ –25 V, 5 mA ≤ I_O ≤ 350 mA	–4.75		–5.25	
Line Regulation	REG_{IN}	T_J = 25 °C, –7 V ≤ V_{IN} ≤ –25 V		18	50	mV
		T_J = 25 °C, –8 V ≤ V_{IN} ≤ –18 V		10	30	
Load Regulation	REG_L	T_J = 25 °C, 5 mA ≤ I_O ≤ 500 mA		15	100	mV
		T_J = 25 °C, 5 mA ≤ I_O ≤ 350 mA		10		
Quiescent Current	I_{BIAS}	T_J = 25 °C		4.3	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–8 V ≤ V_{IN} ≤ –25 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	
Output Noise Voltage	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		45	200	$\mu V_{r.m.s.}$
Ripple Rejection	R • R	T_J = 25 °C, f = 120 Hz, –8 V ≤ V_{IN} ≤ –18 V, I_O = 100 mA	50	72		dB
Dropout Voltage	V_{DIF}	T_J = 25 °C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25 °C, V_{IN} = –25 V		500		mA
Peak Output Current	I_{Opeak}	T_J = 25 °C	620	880	1 020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		0.2		mV/°C

μPC79M08

(V_{IN} = –14 V, I_O = 350 mA, 0 °C ≤ T_J ≤ +125 °C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25 °C	–7.7	–8.0	–8.3	V
		–10.5 V ≤ V_{IN} ≤ –25 V, 5 mA ≤ I_O ≤ 350 mA	–7.6		–8.4	
Line Regulation	REG_{IN}	T_J = 25 °C, –10.5 V ≤ V_{IN} ≤ –25 V		20	80	mV
		T_J = 25 °C, –11 V ≤ V_{IN} ≤ –21 V		15	50	
Load Regulation	REG_L	T_J = 25 °C, 5 mA ≤ I_O ≤ 500 mA		20	160	mV
		T_J = 25 °C, 5 mA ≤ I_O ≤ 350 mA		15		
Quiescent Current	I_{BIAS}	T_J = 25 °C		4.3	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–10.5 V ≤ V_{IN} ≤ –25 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	
Output Noise Voltage	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		65	220	$\mu V_{r.m.s.}$
Ripple Rejection	R • R	T_J = 25 °C, f = 120 Hz, –11.5 V ≤ V_{IN} ≤ –21.5 V, I_O = 100 mA	50	66		dB
Dropout Voltage	V_{DIF}	T_J = 25 °C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25 °C, V_{IN} = –25 V		500		mA
Peak Output Current	I_{Opeak}	T_J = 25 °C	620	880	1 020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		0.3		mV/°C

μPC79M12

(V_{IN} = –19 V, I_O = 350 mA, 0 °C ≤ T_J ≤ +125 °C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25 °C	–11.5	–12	–12.5	V
		–14.5 V ≤ V_{IN} ≤ –30 V, 5 mA ≤ I_O ≤ 350 mA	–11.4		–12.6	
Line Regulation	REG_{IN}	T_J = 25 °C, –14.5 V ≤ V_{IN} ≤ –30 V		25	80	mV
		T_J = 25 °C, –15 V ≤ V_{IN} ≤ –25 V		20	50	
Load Regulation	REG_L	T_J = 25 °C, 5 mA ≤ I_O ≤ 500 mA		35	240	mV
		T_J = 25 °C, 5 mA ≤ I_O ≤ 350 mA		25		
Quiescent Current	I_{BIAS}	T_J = 25 °C		4.4	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–14.5 V ≤ V_{IN} ≤ –30 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	
Output Noise Voltage	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		125	280	$\mu V_{r.m.s.}$
Ripple Rejection	R • R	T_J = 25 °C, f = 120 Hz, –15 V ≤ V_{IN} ≤ –25 V, I_O = 100 mA	50	64		dB
Dropout Voltage	V_{DIF}	T_J = 25 °C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25 °C, V_{IN} = –30 V		400		mA
Peak Output Current	I_{Opeak}	T_J = 25 °C	620	880	1 020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		0.4		mV/°C

μPC79M15

(V_{IN} = –23 V, I_O = 350 mA, 0 °C ≤ T_J ≤ +125 °C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25 °C	–14.4	–15	–15.6	V
		–17.5 V ≤ V_{IN} ≤ –30 V, 5 mA ≤ I_O ≤ 350 mA	–14.25		–15.75	
Line Regulation	REG_{IN}	T_J = 25 °C, –17.5 V ≤ V_{IN} ≤ –30 V		30	80	mV
		T_J = 25 °C, –18 V ≤ V_{IN} ≤ –28 V		25	50	
Load Regulation	REG_L	T_J = 25 °C, 5 mA ≤ I_O ≤ 500 mA		50	240	mV
		T_J = 25 °C, 5 mA ≤ I_O ≤ 350 mA		35		
Quiescent Current	I_{BIAS}	T_J = 25 °C		4.4	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–17.5 V ≤ V_{IN} ≤ –30 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	
Output Noise Voltage	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		150	360	$\mu V_{r.m.s.}$
Ripple Rejection	R • R	T_J = 25 °C, f = 120 Hz, –18.5 V ≤ V_{IN} ≤ –28.5 V, I_O = 100 mA	50	62		dB
Dropout Voltage	V_{DIF}	T_J = 25 °C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25 °C, V_{IN} = –30 V		400		mA
Peak Output Current	I_{Opeak}	T_J = 25 °C	620	880	1 020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		0.6		mV/°C

μPC79M18

(V_{IN} = –27 V, I_O = 350 mA, 0 °C ≤ T_J ≤ +125 °C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25 °C	–17.3	–18	–18.7	V
		–21 V ≤ V_{IN} ≤ –33 V, 5 mA ≤ I_O ≤ 350 mA	–17.1		–18.9	
Line Regulation	REG_{IN}	T_J = 25 °C, –21 V ≤ V_{IN} ≤ –33 V		30	80	mV
		T_J = 25 °C, –24 V ≤ V_{IN} ≤ –30 V		25	50	
Load Regulation	REG_L	T_J = 25 °C, 5 mA ≤ I_O ≤ 500 mA		60	300	mV
		T_J = 25 °C, 5 mA ≤ I_O ≤ 350 mA		45		
Quiescent Current	I_{BIAS}	T_J = 25 °C		4.4	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–21 V ≤ V_{IN} ≤ –33 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	
Output Noise Voltage	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		200	440	$\mu V_{r.m.s.}$
Ripple Rejection	R • R	T_J = 25 °C, f = 120 Hz, –22 V ≤ V_{IN} ≤ –32 V, I_O = 100 mA	50	60		dB
Dropout Voltage	V_{DIF}	T_J = 25 °C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25 °C, V_{IN} = –33 V		350		mA
Peak Output Current	I_{Opeak}	T_J = 25 °C	620	880	1 020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		0.8		mV/°C

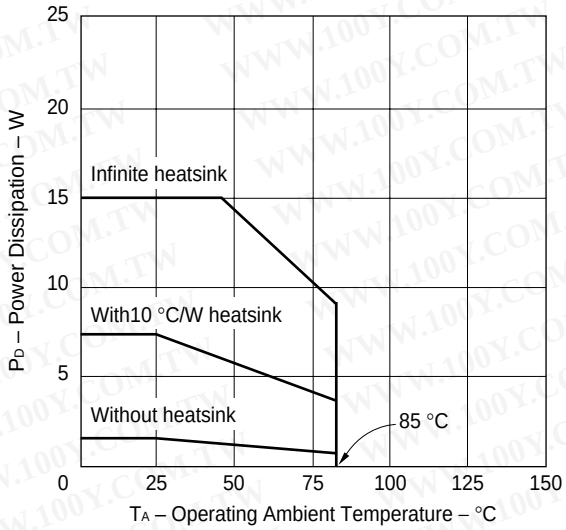
μPC79M24

(V_{IN} = –33 V, I_O = 350 mA, 0 °C ≤ T_J ≤ +125 °C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

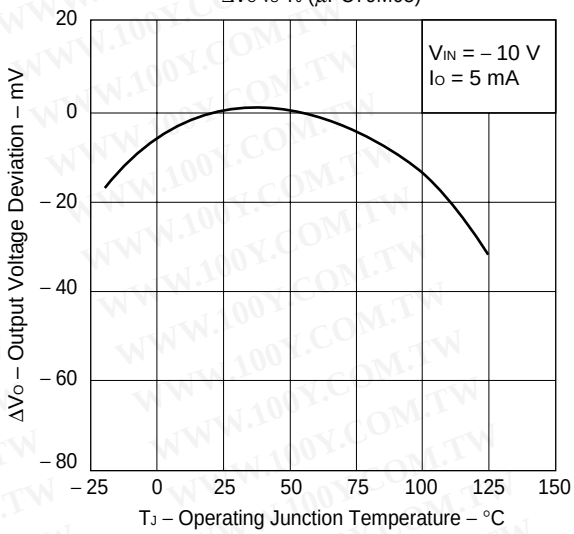
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25 °C	–23.0	–24	–25.0	V
		–27 V ≤ V_{IN} ≤ –38 V, 5 mA ≤ I_O ≤ 350 mA	–22.8		–25.2	
Line Regulation	REG_{IN}	T_J = 25 °C, –27 V ≤ V_{IN} ≤ –38 V		30	80	mV
		T_J = 25 °C, –30 V ≤ V_{IN} ≤ –36 V		25	50	
Load Regulation	REG_L	T_J = 25 °C, 5 mA ≤ I_O ≤ 500 mA		80	360	mV
		T_J = 25 °C, 5 mA ≤ I_O ≤ 350 mA		50		
Quiescent Current	I_{BIAS}	T_J = 25 °C		4.5	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–27 V ≤ V_{IN} ≤ –38 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	
Output Noise Voltage	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		250	600	$\mu V_{r.m.s.}$
Ripple Rejection	R • R	T_J = 25 °C, f = 120 Hz, –28 V ≤ V_{IN} ≤ –38 V, I_O = 100 mA	50	57		dB
Dropout Voltage	V_{DIF}	T_J = 25 °C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25 °C, V_{IN} = –38 V		200		mA
Peak Output Current	I_{Opeak}	T_J = 25 °C	620	880	1 020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		1.0		mV/°C

TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)

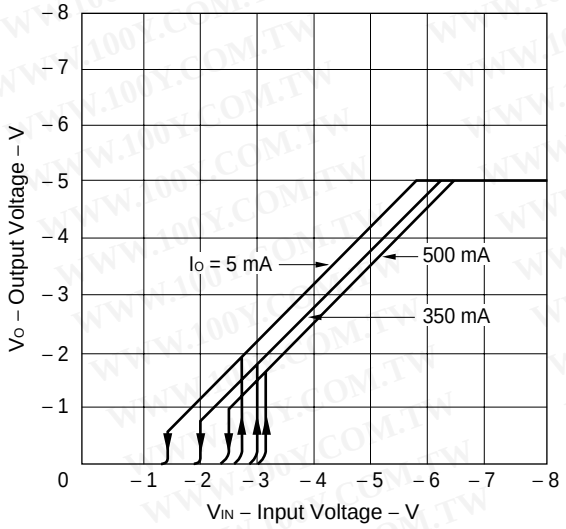
P_D vs T_A



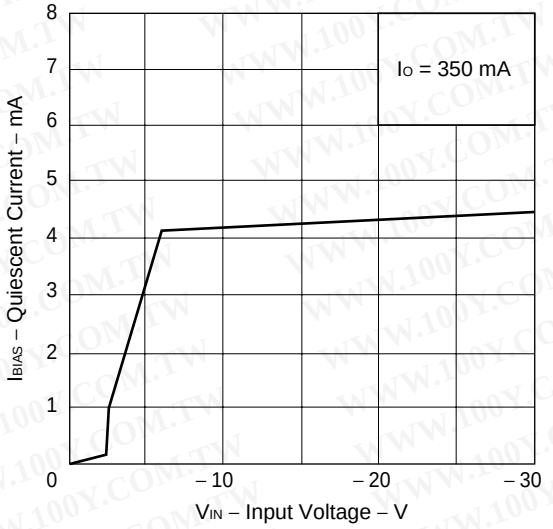
ΔV_O vs T_J (μPC79M05)



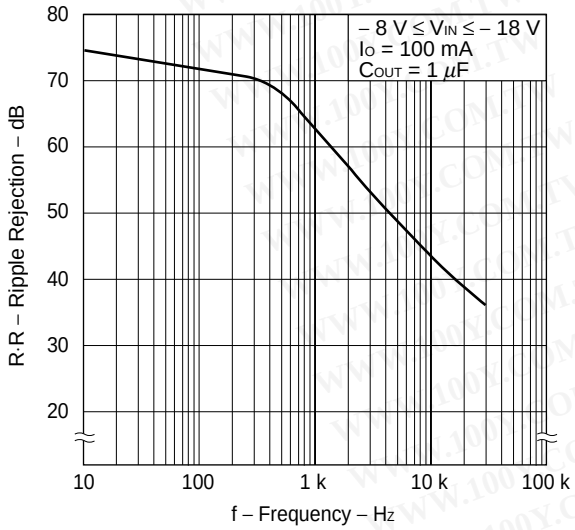
V_O vs V_{IN} (μPC79M05)



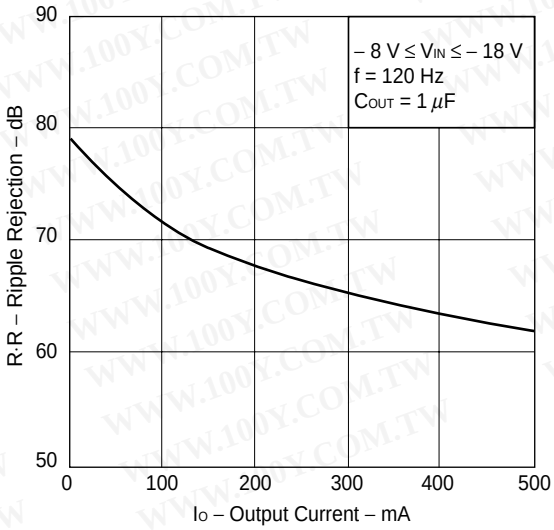
V_{IN} vs I_{BIAS} (μPC79M05)



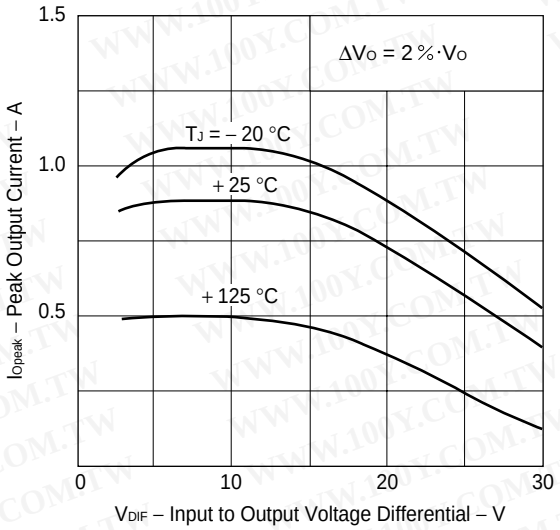
R·R vs f (μPC79M05)



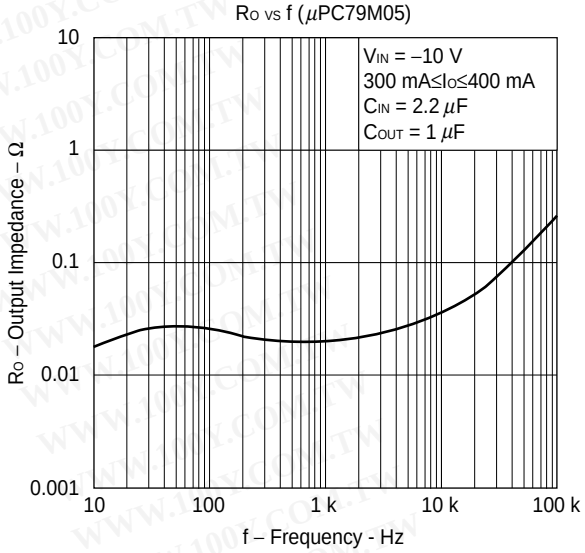
R·R vs I_O (μPC79M05)



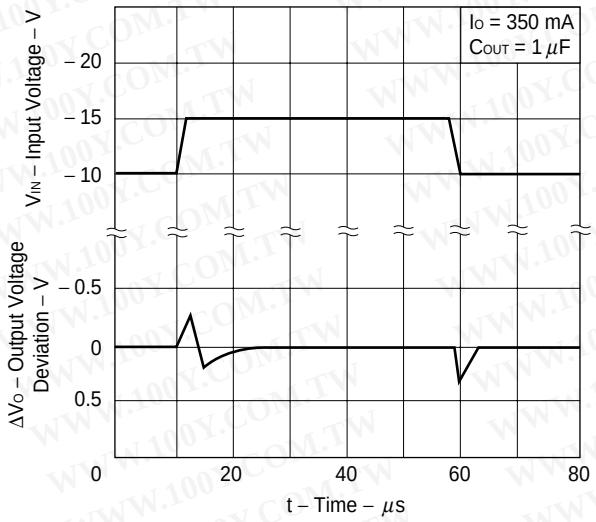
I_{Opeak} vs V_{DIF}



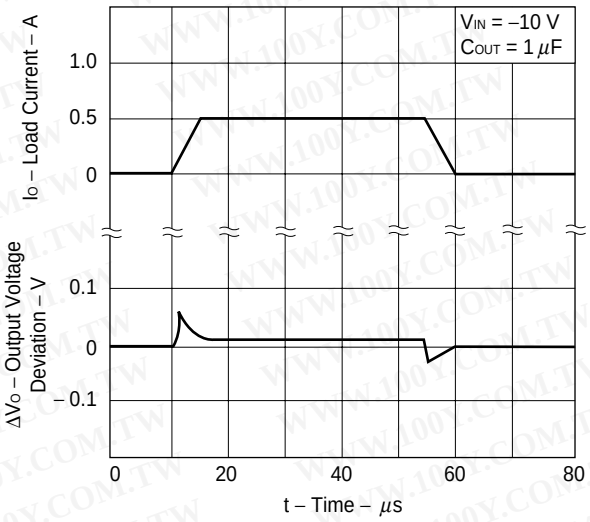
R_O vs f (μPC79M05)



LINE TRANSIENT RESPONSE (μPC79M05)

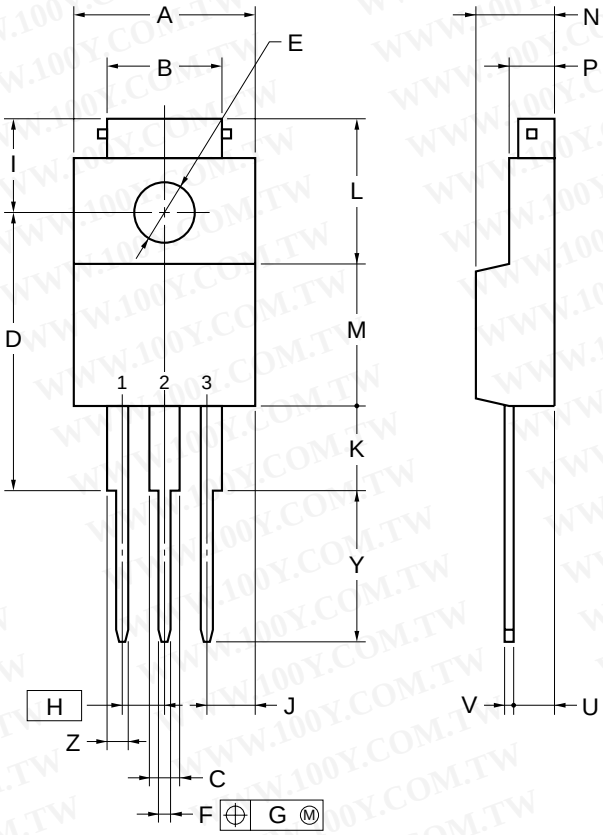


LOAD TRANSIENT RESPONSE (μPC79M05)



PACKAGE DRAWINGS

3PIN PLASTIC SIP (MP-45G)



NOTE

Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	10.4 MAX.	0.410 MAX.
B	7.0	0.276
C	1.2 MIN.	0.047 MIN.
D	17.0±0.3	$0.669^{+0.013}_{-0.012}$
E	ϕ3.3±0.2	ϕ0.130±0.008
F	0.75±0.10	$0.030^{+0.004}_{-0.005}$
G	0.25	0.010
H	2.54 (T.P.)	0.100 (T.P.)
I	5.0±0.3	0.197±0.012
J	2.66 MAX.	0.105 MAX.
K	4.8 MIN.	0.188 MIN.
L	8.5	0.335
M	8.5	0.335
N	4.5±0.2	0.177±0.008
P	2.8±0.2	$0.110^{+0.009}_{-0.008}$
U	2.4±0.5	$0.094^{+0.021}_{-0.020}$
V	0.65±0.10	$0.026^{+0.004}_{-0.005}$
Y	8.9±0.7	0.350±0.028
Z	1.0 MIN.	0.039 MIN.

P3HF-254B-3

RECOMMENDED SOLDERING CONDITIONS

When soldering these products, it is highly recommended to observe the conditions as shown below. If other soldering processes are used, or if the soldering is performed under different conditions, please make sure to consult with our sales offices.

For more details, refer to our document **"SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (C10535E)**.

Type of Through-hole Devices

μPC79M05HF, 79M08HF, 79M12HF, 79M15HF, 79M18HF, 79M24HF: 3-pin plastic SIP (MP-45G)

Process	Conditions
Wave soldering (only to leads)	Solder temperature: 260 °C or below, Flow time: 10 seconds or less.

Caution For through-hole device, the wave soldering process must be applied only to leads, and make sure that the package body does not get jet soldered.

★ REFERENCE DOCUMENTS

Quality Grades on NEC Semiconductor Devices	C11531E
Semiconductor Device Mounting Technology Manual	C10535E
IC Package Manual	C10943X
Guide to Quality Assurance for Semiconductor Devices	MEI-1202
Semiconductors Selection Guide	X10679E
NEC Semiconductor Device Reliability/Quality Control System	IEI-1212
-Three Terminal Regulator	

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The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

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